VIRGINIA WILDLIFE

SEPTEMBER 1995 ONE DOLLAR

Let's Get The Facts About Bears

Director's Column

William L. Woodfin, Jr.

The bear has a unique place in American culture as the warmest, cuddliest predator in the woods. Bears have been the elemental driving force in stories about campers fearing they might be eaten by the animals, and their likeness in the form of stuffed toys has for decades been a perennial favorite of young children and adult collectors. The bear is feared as an uncontrollable man-eater but loved and cuddled as a Teddy Bear.

What's wrong with these pictures?

For one thing, we do not have man-eating bears in Virginia, and haven't, at least not in recorded history. There are no grizzlies in Virginia. As far as cuddly goes, anyone who understands the true nature of wildlife knows that the wrong kind of human contact may not only be troublesome for humans, like getting bitten by an animal you should not be trying to pet, but can also be extremely disruptive and damaging for the animal itself.

Putting aside everything but real science, what are the hard facts about the black bear populations in Virginia? That is what we're seeking to discover in our work in the Cooperative Alleghany Bear Study (CABS). The Code of Virginia charges the Department of Game and Inland Fisheries to conduct operations for the preservation and propagation of game animals and other wildlife, to increase, replenish and restock the lands of the Commonwealth. We are doing precisely that in CABS.

This ambitious study is expected to be long-lived and far-reaching in its implications. It will last for several years, and it will focus on two areas of Virginia; Augusta and Rockingham counties, in the central Shenandoah Valley, and Craig and Giles counties in southwestern Virginia. By closely studying the dynamics of the black bear populations in these two areas, our wildlife managers will be able to evaluate and predict population trends for more effective management of Virginia black bears.

Doing science in the wild requires dedication and fortitude. The data gathered by tireless CABS researchers will help us develop an improved method of modeling, monitoring and estimating bear populations; the data will yield age-specific birth and death rates, as well as the overall trends in the population. The data will also tell us about regional population density levels and assess inputs affecting the population, such as nutrition, timber management, hunting, and the dog training season. We feel we already have evidence that shows the population is not only resilient in adapting to available habitats, but that the population is responsive to conservation management and is in fact expanding.

Here at the Department , we understand that hard scientific data is not the first thing that comes to mind when someone mentions bears. However, for the sake of the bears and those who take a personal interest in them, we are openly and energetically seeking the objective data that will add up to an accurate and truthful picture of the black bear populations in Virginia.

Primary funding for CABS comes from VDGIF, but several other contributors are also part of the research effort.

One final note. Because of the mild mannered nature of Virginia black bears, we offer some advice to those who might make visual contact with one of these large animals. What should you do next time you see a black bear? Don't panic. Grab a camera and take pictures, lots of them. Because bears are extremely secretive, it may be your only opportunity. □

Bill Lea

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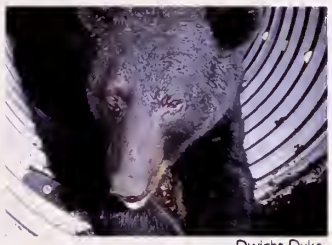
Cover: American black bear, *(Ursus americanus)*; photo be Bill Lea
Back cover: Jerry Blank, wildlife biologist assistant, working a den tree; photo by Dwight Dyke.



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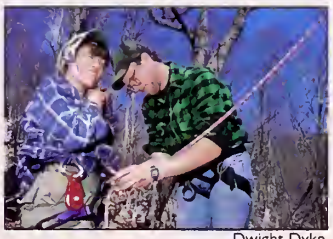

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Bill Lea

A History of Black Bear In

by Dennis Martin

Accounts of black bears prior to and during settlement of North America can offer insight into the distribution and use of this valuable, renewable resource. There is some historic information, but not much scientific data about bear populations in precolonial times. We know black bears were important in the life of the Indian during this period. It was thought by some early writers that the black bear was second only to white-tailed deer in importance to the Indians in the southeastern United States. During this period the tidewater, piedmont and mountainous areas of Virginia were occupied by the Algonquian, Sioux, Cherokee and Iroquoian peoples.

Native Americans used bears and other wildlife for many valuable commodities. Bear skins were made into heavy winter robes, moccasins and blankets. Twisted bear gut was made into durable bowstrings. Teeth and claws were used as ornaments. The meat was described as good, and the Indian often hunted bears in the winter while they were denning. Bear fat was perhaps the most important portion of the bear carcass; it was used as butter, body and hair oil, and as a component of the body paint often used by many Indian tribes. The flesh was often believed to be a symbol of courage, strength or wisdom.

When discovered by the first settlers of eastern Virginia, the Indian culture was based on hunting,

Lee Walker

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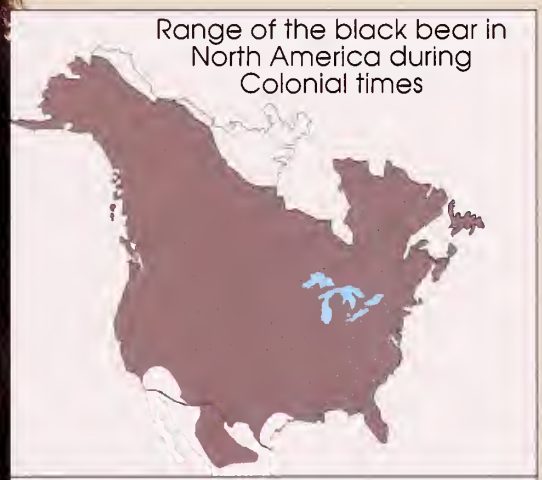
fishing, and agriculture. The descriptions of precolonial forests make them sound park-like, with open areas and stands of mature trees. Openings in these forests were often maintained by frequent fires set by the Indians perhaps for hunting or for protection from other Indian tribes, to create food such as berries or other soft mast, or for agriculture.

Large tracts of land were kept open; the largest perhaps being referred to as "The Barrens," which extended from the Shenandoah Valley into Pennsylvania. One writer estimated that there were 817,000 acres of open land in precolonial Virginia. It is interesting to note that as old fields were worn out, new ones were cleared to replace them. These openings attracted deer, elk and buffalo and were favorite hunting grounds for the Indian. These openings would also have attracted the omnivorous feeding habits of the black bear which could have fed on grasses, forbs, small rodents, and soft mast-like berries.

The earliest recorded description of the bear in the southeastern United States was written in the 1580's by Thomas Hariot who provided insight into the role bears played in settling North Carolina. The black bear supplied the colonial hunter with excellent quality meat, according to Hariot, and when pursued, the bear would climb a tree and could be easily taken.

Following colonization the settlers copied many of the agricultural practices of the Indians. Hunting and livestock supplied the meat and protein in their diet. A considerable



Left: Dense vegetation, an important source of bear food and cover, was in short supply when Virginia was first settled. Native Americans and European settlers used bears for food, footwear, hats, blankets, bow strings and water repellant oils. ***Above:*** *The original range of black bears has changed since records were first kept. Map graphics by Pels.*

number of bears were reported around Jamestown, the Dismal Swamp and many areas of the Piedmont. One account reported that "the bear was important to settlers of western Virginia, and many of the written reports from this region mentioned the taking of bears for food or skins. George Washington detailed Major Andrew Lewis and his men to attack Indian towns along the Ohio River; in their pursuit of the Indians they left a site near the present town of Salem, Virginia and in the vicinity of Tazewell County they killed three or four bears. This was in February of 1756. A settler named James Burke moved with his family into what is now Burke's Garden, Tazewell County, in 1754. During the next year he reportedly killed a large number of bears and brought the skins back with him. Thus it appears that during the colonial period, bears were generally plentiful and were found in all regions of the state."

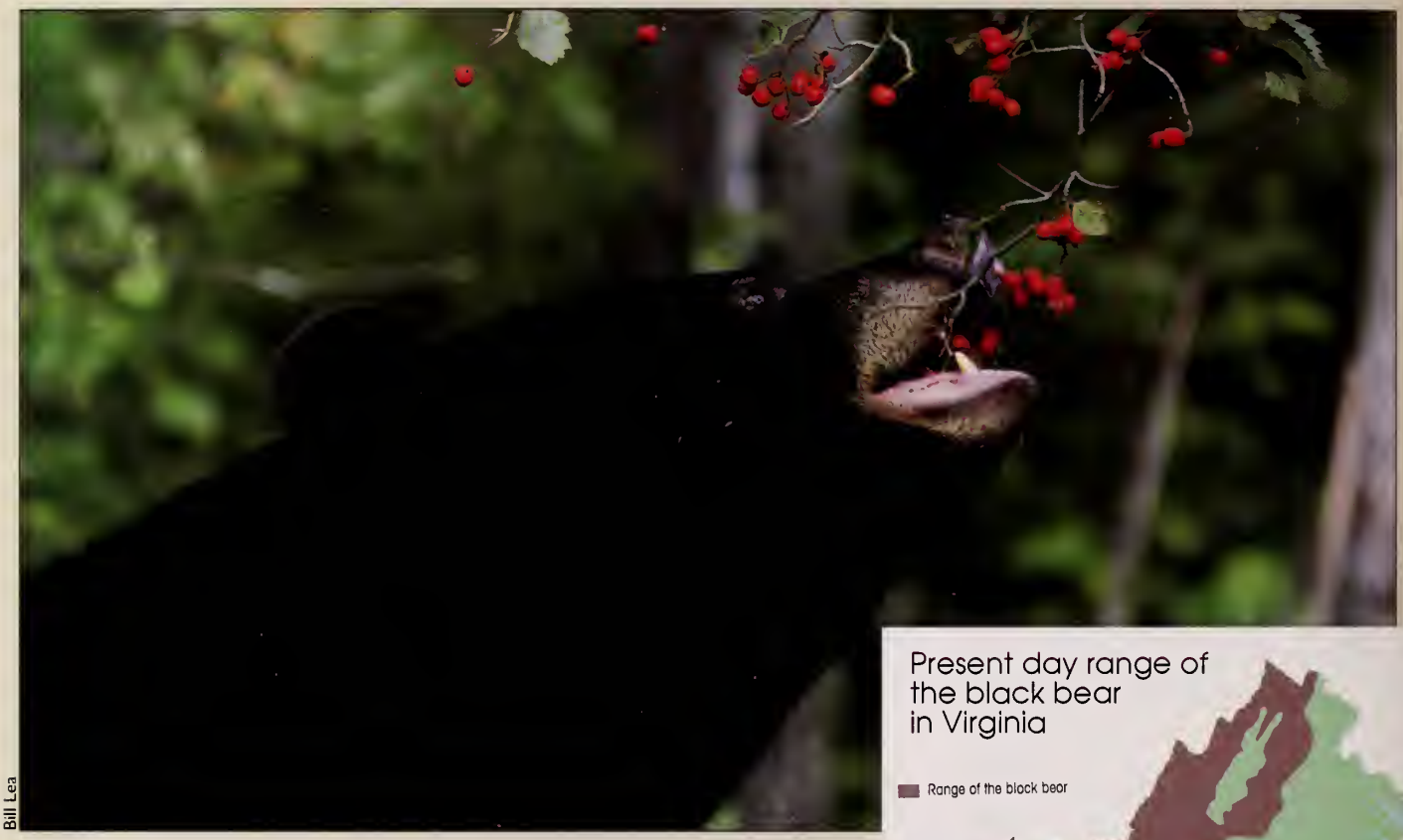
John James Audubon, 1785-1851, the American ornithologist, arrived in the U.S. in 1803 and began extensive observations of both birds and mammals. In his *Viviparous Quadrupeds of North America* (1842-46) he describes both a black bear and a cinnamon bear which he felt were the same species. Others indicated they were different species because their ranges were not identical and the cinnamon bear had "much finer, thicker and longer hair, with a greater proportion of fur mixed with it." There are no known records of a brown phase black bear—cinnamon bear— in Virginia, although they are common in the west, and at least one was reported in recent years in Pennsylvania.

As the interior and western portions of the new world were settled, both color phases, which are now considered one species *(Ursus americanus)*, were trapped and their hides traded. Leg-hold traps and large deadfalls were often used. Some eastern settlers set traps with guns primed for firing; as the bear took the bait (often a live owl) a string attached to the trigger fired the gun killing the bear.

Bears were listed among the animals shipped to markets from the rail yards at Staunton. Frontiersmen considered bear meat to be the best available with raccoon running a close second.

Colonists also used the bear for sleigh-robes, caps or hats and as a comfortable bed. Bears were sometimes kept as pets in some heavily populated areas.

Bears eat a wide range of foods, and early farmers within black bear range experienced crop and livestock damage, similar to today. Bears occasionally feed on pigs, cows or calves. Furthermore, corn has often been the target of bears. Early naturalists indicated that a large part of the bears' diet was mast



Bill Lea

Above: *Bears eat a wide range of food, including tender grass, berries, carrion, insects, acorns, and other tree fruits.* ***Right:*** *Most occupied bear habitat is in the mountainous counties and in the Great Dismal Swamp Refuge. Virginia's black bear population may be expanding; there have been frequent sightings in the Piedmont. Map graphics by Pels.*

(nuts and berries) and honey or larvae in bee trees. Bears were frequently seen catching fish and crayfish, and feeding on roots and berries. Audubon described hunting bears in cornfields using horses, and the "cur-dogs" of the plantations.

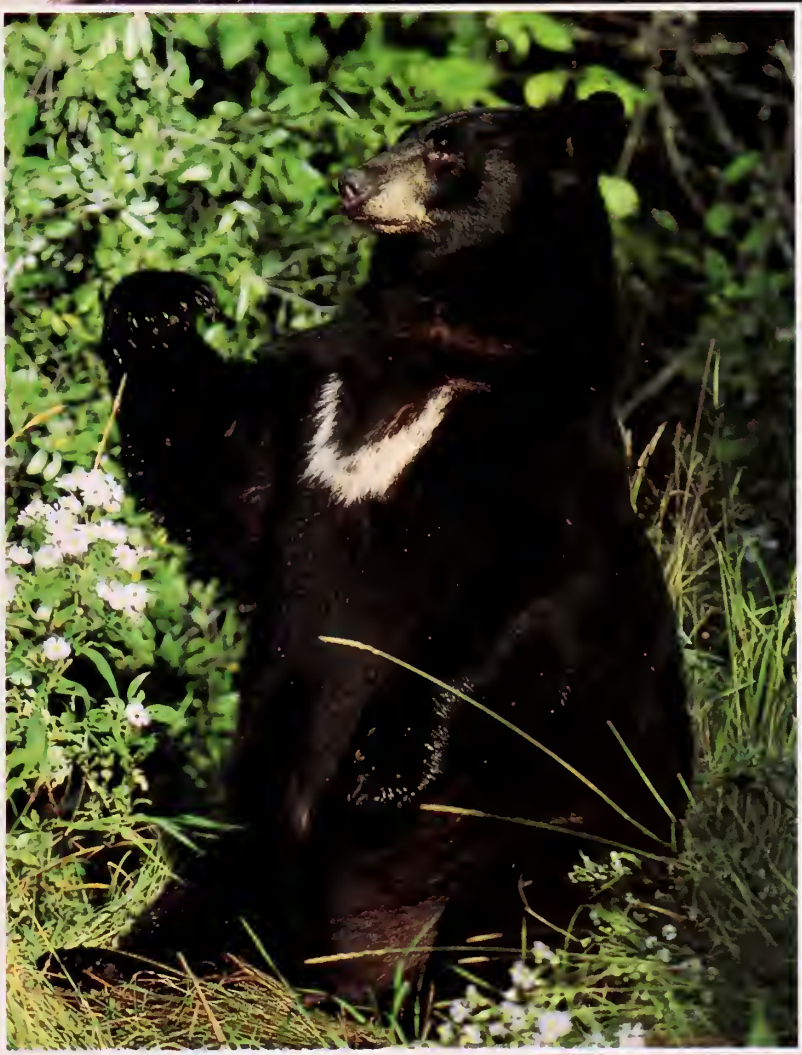
A decrease in the number of bears in more settled areas was reported during the 19th century, but the bear population in swamps and other lands unsuitable for cultivation, seemed to increase. At the end of the postcolonial period black bears were plentiful in the mountains and in the Great Dismal Swamp, however the bear population had been severely reduced in most of tidewater and piedmont Virginia.

Early Virginia Department of Game and Inland Fisheries' (VDGIF) researchers indicated that the bear originally ranged throughout Virginia, but that by the 1950's the range was restricted to 180 square miles around the Dismal Swamp and 4,116 square miles in the mountainous western counties. This equaled 10.8% of the total land area. Today, 11,287 square miles of forested range, which is 28.4% of the total land in the state, are within the bear hunting counties, and are thought to be occupied bear range. A 1957 VDGIF report estimated the bear population to be 1,102 animals, compared to the current estimate of between 3,500 and 4,500 bears statewide.

Fortunately, our predecessors foresaw the need to manage and use our wildlife wisely. By developing improved land management practices, hunting regulations, information gathering systems (research and inventory), wildlife managers have provided great benefits to the black bear and many other wildlife species in the Commonwealth. This historical perspective provides a foundation of knowledge on which to provide effective bear management decisions. □

Dennis Martin is the state black bear and furbearer program manager working out of the Verona Regional Office near Staunton.

Natural History of the Black Bear



Bill Lea

A white blaze on the chest of Virginia's black bears is not as common as in other states. In Virginia, the blaze is more common in southeastern bears than in mountain populations.

by Adam Vashon

The American black bear *(Ursus americanus)* was once found throughout North America. Today, it is still the most common and widespread species of bear in North America.

Typically compact, heavy-structured animals, adult male black bears are five to six feet long, two to three feet high and weigh 100-400 pounds. Its fur is uniform black except for a brown muzzle, and some bears may have a V-shaped white blaze across their chests. They walk on their entire foot, as humans do, and have curved non-retractable claws which allow them to climb trees with remarkable ease and dexterity.

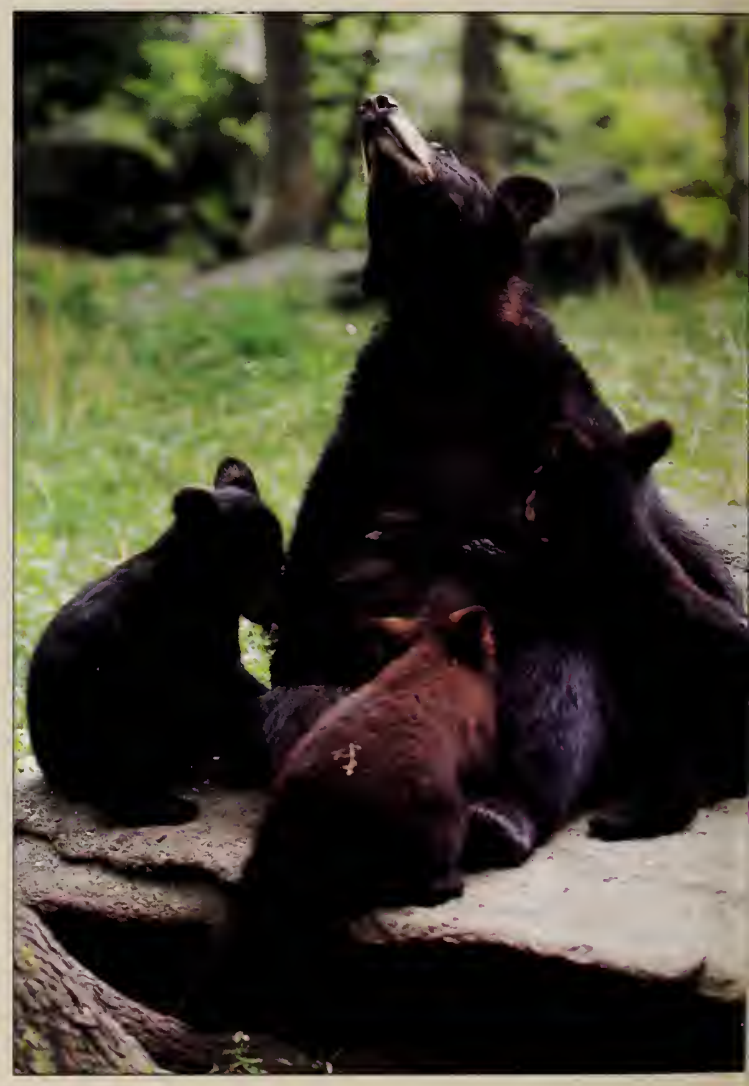
Donald M. Jones

for the adult female who travels with her offspring. Black bears eat a wide variety of foods, and to some people's surprise, they commonly live strictly on vegetable matter for many months of the year. Actually, black bears eat both plant and animal matter which makes them "omnivorous."

are generally hard mast consisting of acorns, hickory nuts, and beechnuts. Black bears are known to travel extensively in search of these foods, even out of their normal range.

In years when mast crops are abundant, black bears can gain weight rapidly. In late summer and fall subadults and females can gain approximately one-half pound per day while adult males can gain up to two pounds per day. In years when mast crops fail, it is common for nuisance complaints of black bears to increase, due to the need for finding alternate food sources.

Donald M. Jones



Top: Not all black bears are black in color; color variations like the brown or "cinnamon" phase of black bear are common in many western states, but they are not known to occur in Virginia. ***Above:*** *Grizzly bears, usually much larger than black bears, do not occur in Virginia. Outside of Canada and Alaska, grizzly bears are restricted to isolated populations in a few western states.* ***Right:*** *Brown phase black bears can often be born to a completely black sow.*

Color phases exist in black bears and include brown, white and blue. The brown phase, known as the cinnamon bear, is found typically in the western United States, but not in Virginia.

We must distinguish black bears from other species. The grizzly bear *(Ursus arctos)* is indeed different from the black bear. Grizzlies are considerably larger, over six feet long, three and one-half feet high and can weigh up to 850 pounds.

Black bears are chiefly nocturnal animals (active during nighttime hours), although daytime movements do occur frequently. These animals are typically solitary, except

Black bears are also termed "opportunistic" in their feeding habits; that is, they will readily feed on the foods that are easily available to them. In the spring, they will consume grasses, forbs, and other plants until soft mast, such as berries, become present in the summer months. Examples of summertime foods include serviceberries, pin cherries, blueberries, and huckleberries. Fall foods

Fall is the most crucial feeding time for black bears. It is this time when they must put on the weight that they will rely on to carry them through the cold winter months of the denning season.

Winter is known to be a serious threat to black bears. Extreme cold conditions can limit food and create great energy expenditures. Winter is also the time when pregnant females give birth to their young. Pregnant females are under additional nutritional stress, because not only do they have to give birth, but they also must continue to produce milk without consuming any food or water. The ability to withstand long periods without food or water makes black bears physiologically unique from other mammals. Though they do not technically hibernate, their body temperature and heart rate slightly decreases, while normal body functions such as urination and defecation cease completely. These mechanisms will continue throughout the winter and early spring, and as a result, extreme weight loss can occur. When bears leave the den in early spring, food availability is limited and they may continue to lose weight. Once summer foods become available, weights begin to stabilize and eventually increase.

Adult females will give birth to an average of one to three (maximum of six observed) cubs during late January to early February. A cub's eyes open in 25 to 30 days after birth. Bear cubs are weaned in August, but will remain with their mother for another year and den with her the following winter. In June and July of the next year, adult females will force their young to leave when the mating season begins.

Reproduction in black bears is extremely low, the second lowest reproduction of any land mammal in North America. Female black bears are typically three to five years old by their first successful litter, and produce only one litter every two years.

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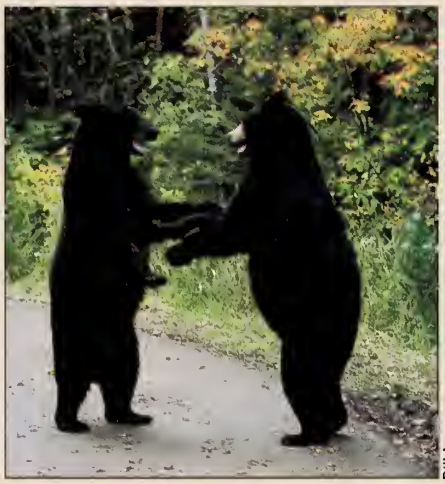

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Above: *Black bears den from about November through April and will often rest at the den entrance as weather improves.*
Right: *Minor confrontations between siblings are common and usually uneventful. However injuries can occur when males compete for territory or mating privileges.*

The normal range an animal frequents throughout the year is known as its "home range." Home ranges of black bears can vary considerably depending on age, habitat type, sex, season, and population density. An adult male's home range is approximately 15 square miles, and an adult female's home range is approximately 10 square miles. Home ranges of black bears must provide food, water, den sites, and adequate concealment.

Adult females usually will tolerate their offspring within their home range up to a year after family breakup. Subadult males will disperse to a new home range, while subadult females will usually stay and occupy a portion of their mother's home range. If the mother should die, the open home range likely will be filled by the younger female. Interestingly, ranges of both sexes in all ages can overlap, but specific areas are rarely used simultaneously. As an example, young male bears will almost always avoid older males.

Black bears demonstrate capabilities matched by no other mammal. Their great ability to overcome adverse conditions and adapt to changing situations is most likely why they are able to occupy such a wide and diverse geographic area throughout the country. □

Adam Vashon is employed by VPI & SU as a full-time field technician for the Cooperative Alleghany Bear Study. He graduated from the University of Maine in August of 1993 with a B.S. in Wildlife Management. He has been with the project since May 1993.

Black Bear Habitat Management in Virginia

by Al Bourgeois, David Kocka and Scott Klinger

Bill Lea

Since 1938, the Virginia Department of Game and Inland Fisheries (VDGIF) and the U. S. Forest Service have been cooperatively managing the wildlife resources of the National Forests in Virginia. The current Revised Management Plan for the combined George Washington and Jefferson National Forests places increased emphasis on habitats for black bear and associated species. The Cooperative Alleghany Bear Study (CABS) is part of the ongoing research being conducted by the VDGIF and the Forest Service.

Bears are secretive animals, preferring large forested areas and little human contact, but we need to dispel the myth that unmanaged forests and "wilderness areas" are the only habitat used by black bears. In managing VDGIF and Forest Service lands, the bear's basic habitat needs of food, cover and protection are met in forests with a diversity of tree species and age classes. For example, bears thrive in habitats that

Mel White

Left: Fruits of trees and shrubs are important bear foods. Although considered a carnivore, the majority of the diet of a black bear is vegetation.
Top: Bears prefer heavy understories for escape cover, feeding areas, and shade. Areas of harvested timber can offer this type of habitat.
Above: VDGIF Director William Woodfin (**right**) and George Washington National Forest acting supervisor Steve Parsons discuss the Cooperative Alleghany Bear Study.

Bill Lea

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Bill Lea

comprise both young, shrubby cutovers and mature to over-mature hardwoods.

Of course, some places are better than others when it comes to pleasing a black bear, and there seem to be four characteristics common to good bear habitat: 1) large forested areas over which to roam with minimal disturbance, 2) habitat with limited permanent road access, 3) abundant berry and nut crops, and 4) areas of dense vegetation, like young cutovers, for escape cover. While unmanaged land can sometimes provide all these elements, managed forest lands can offer improved conditions for black bear populations.

The George Washington and Jefferson National Forests, the Shenandoah National Park, the Great Dismal Swamp and the Virginia Department of Game and Inland Fisheries' Wildlife Management Areas provide nearly 2 million acres of our prime bear range in Virginia. However, critically important black bear habitat exists on adjacent private forest land as well. Cooperative efforts to properly manage our forests for black bears and other wildlife species are one of the keys to retaining wildlife populations for future generations to enjoy.

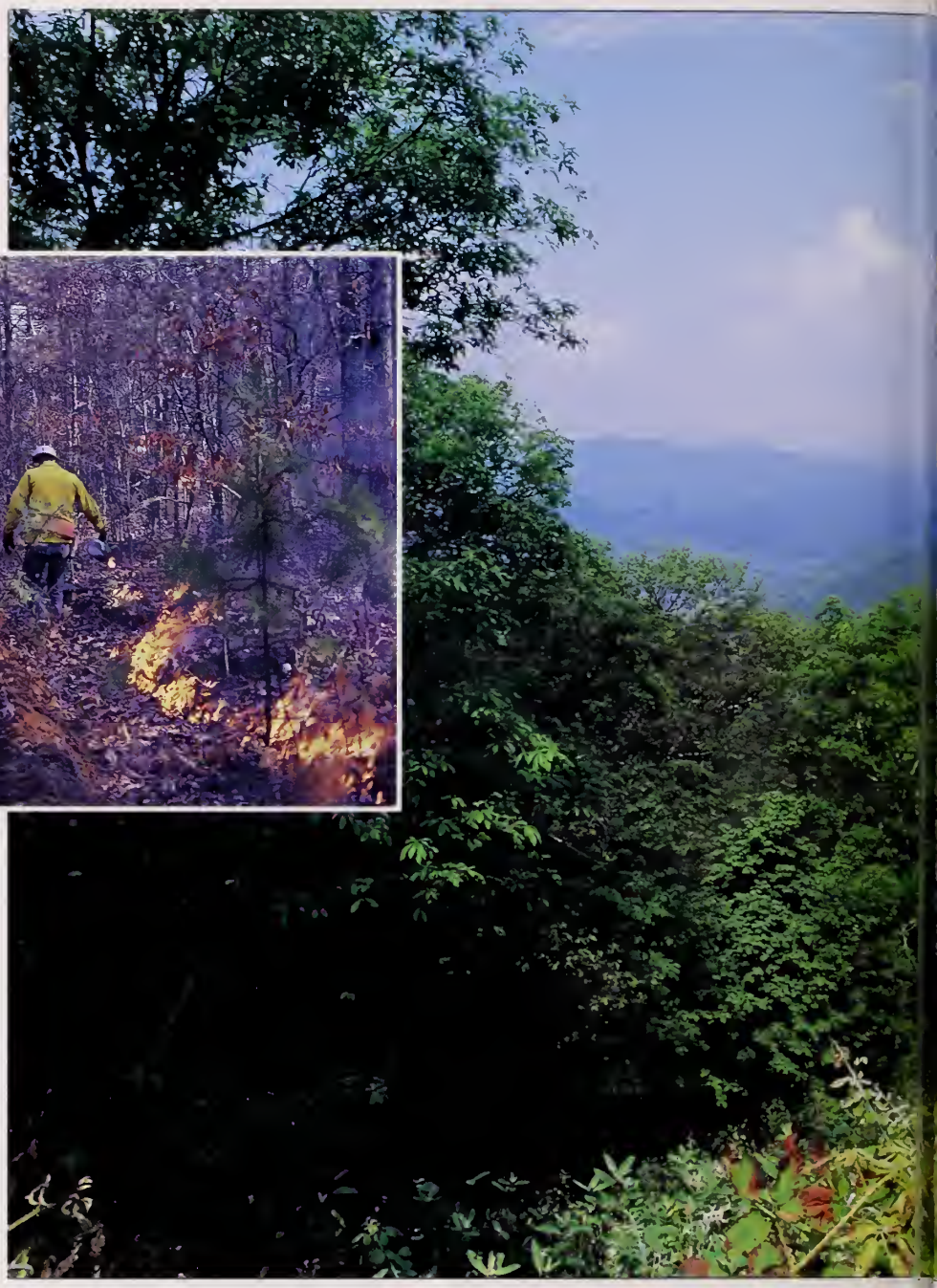
Because creating new forest land or restricting road access are often impractical solutions for bettering bear habitat, we most often turn to managing land to produce more food and escape cover for bears. To manage land with these priorities, we need to understand the bear's needs.

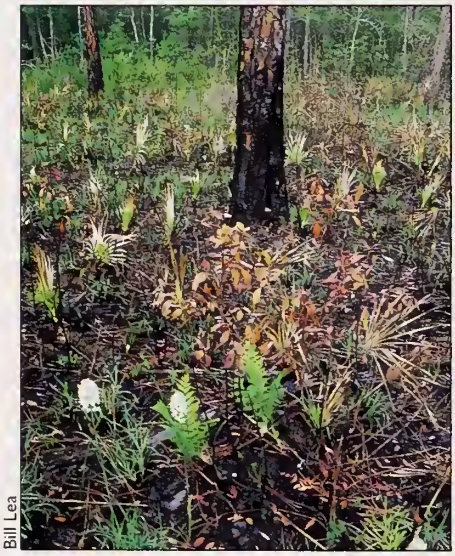
During early spring, following their emergence from winter dens, bears find green vegetation, such as tender grass roots to feed on. Small rodents, insects or carrion are also readily accepted food items. In late spring, with the greening of the woods, young, succulent plants make up most of their diet. In summer and early fall, bears tend to dine on "soft mast" such as blackberries, blueberries, autumn olive, sassafras, and cherry; while in the fall, they turn to vital, high-energy food sources, such as acorns, hickory nuts and beechnuts, which will build up their fat reserves and see them through winter. Dense escape cover

Bill Lea

Top left: *Bears forage for berries in timber harvest areas and along access roads.* ***Bottom left:*** *Rotting logs offer meal opportunities by supplying insects and their larvae.* ***Above:*** *Rock crevices and hollow trees offer the best and most frequently occupied bear dens in the Virginia mountains.*

Bill Lea





Bill Lea

Above: *Properly designed and conducted controlled burns can encourage desirable vegetation, increase available minerals, and encourage insect life for many wildlife species. Bears commonly feed in areas that have been burned.*

Top right: *Timber harvests provide thick cover that support high populations of insects, small mammals, and birds. The resulting growth of tender grass and fruit-bearing shrubs are often fed upon by black bears.*

Bottom right: *Brush piles also provide another type of denning habitat for bears.*

is used year-round, especially during the hunting season.

Knowing these things, several habitat management practices can be used to respond to a bear's needs. Clearcut or shelterwood timber harvest methods create dense thickets that provide convenient escape routes. These cutover areas also contain high populations of small mammals and insects, as well as the grasses, plants, and berries which are essential foods from early spring into fall. In addition, bears will occa-

Dwight Dyke

ited in bear habitat. Young trees (less than 10 years old) should make up no more than 10 percent of prime bear range, with the majority of the forest trees being greater than 50 years old, and of acorn-producing age. Five to 10 percent of the area should include trees over 150 years old to insure an adequate supply of large den sites.

Managing forests with the purpose of improving bear habitat means that individual timber harvests should be less than 25 acres and well dispersed over the forest. Cuts should be located away from open roads and be designed with an irregular shape to maximize the amount of young, shrubby edge habitat created. Protection should be

Dwight Dyke

Bill Lea

Dwight Dyke

Dennis Martin

Top Right: *Plants that require full sunlight encourage dense vegetation following a timber harvest and will provide food and cover for several years.*
Middle right: *Squaw root is a preferred early spring food for bears.*
Bottom right: *Acorns are a preferred food in the fall. However, when acorn crop production fails, the number of bear cubs born will usually drop.*

sionally den in the brushpiles which are left after cutting. Clearcut or shelterwood harvests regenerate oak/hickory stands which require full sunlight to grow and might otherwise be naturally replaced with maple and other trees which do not produce nut crops.

On the other hand, too much of a good thing can turn bad. Since nuts and other hard mast are valuable to bears as they prepare for winter denning, timber harvesting of mast-producing trees should be lim-

Bill Lea

Bill Lea

Top: As excellent swimmers, bears are at home in wetland habitats. Bears have been observed swimming in large bodies of water like the James River.
Above: Old logging roads are readily used by black bears.

given to all spring seeps, vernal ponds, forested wetlands and waterholes, because they provide much needed sources of water for drinking and summer wallowing. These habitats also provide additional items on a black bear's menu, such as skunk cabbage, insects, lizards, frogs, turtles, toads, and snakes.

After harvesting timber, the roads, log decks, and skid trails that are being managed for bear habitat should be seeded with grasses, such as clover, a favorite of bears. Turning a forest into first-class accommodations for black bear can also include planting apple trees, persimmons, hawthorns, cherry trees, and other berry-producing plants heavily used by bears.

Mountain laurel and rhododendron thickets can provide good escape cover, and should be encouraged whenever possible. Thinning forest stands can also provide cover, while at the same time improving acorn production.

Fire has always been a natural occurrence in the Blue Ridge and Alleghany Mountains, and periodically opened the mature forest to allow for younger plant growth. Today, in some instances, prescribed fire is used to mimic the fires of old and create new growth of grasses, wildflowers, shrubs such as blueberries, huckleberries, blackberries, and seedling trees for another generation of forest and bears.

In our forests, bears seem to have no problem finding suitable spots to take that long winter's nap. Potential den sites exist throughout our forests, and although hollow trees are the most common den sites in western Virginia, stumps, snags, rock cavities and brushpiles are also used. Leaving big old trees, including those damaged by wind and lightning, is a good management practice for preserving potential den sites.

While we understand the basic habitat needs of black bears and how to manage for them, several questions still remain unanswered. For example, managers need a better understanding of what comprises prime fall feeding habitats and how far bears will move to find them; what habitats the sows raise their cubs in; and the long-term effects of gypsy moths on bear habitat. Are certain habitats more critical to the long-term vigor of bear populations than others? Projects such as the CABS will provide a greater insight into these and other lingering questions as they relate to habitat management of black bears. ☐

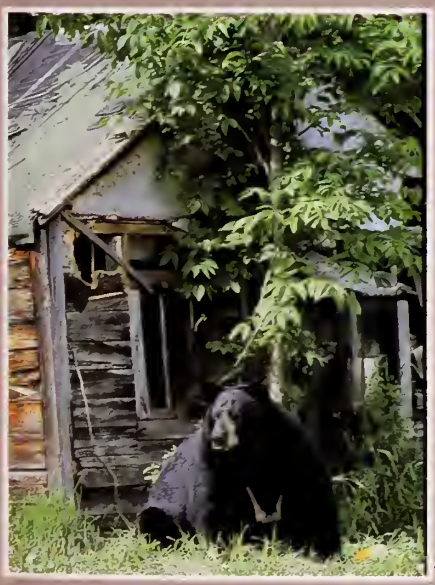
VDGIF District Biologists Al Bourgeois and David Kocka both work in the northwest region of Virginia, where the Alleghany Bear Study was initiated. Scott Klinger is a Staff Biologist on the George Washington and Jefferson National Forests.

Problem Black Bears

by Dennis Martin

Bill Lea

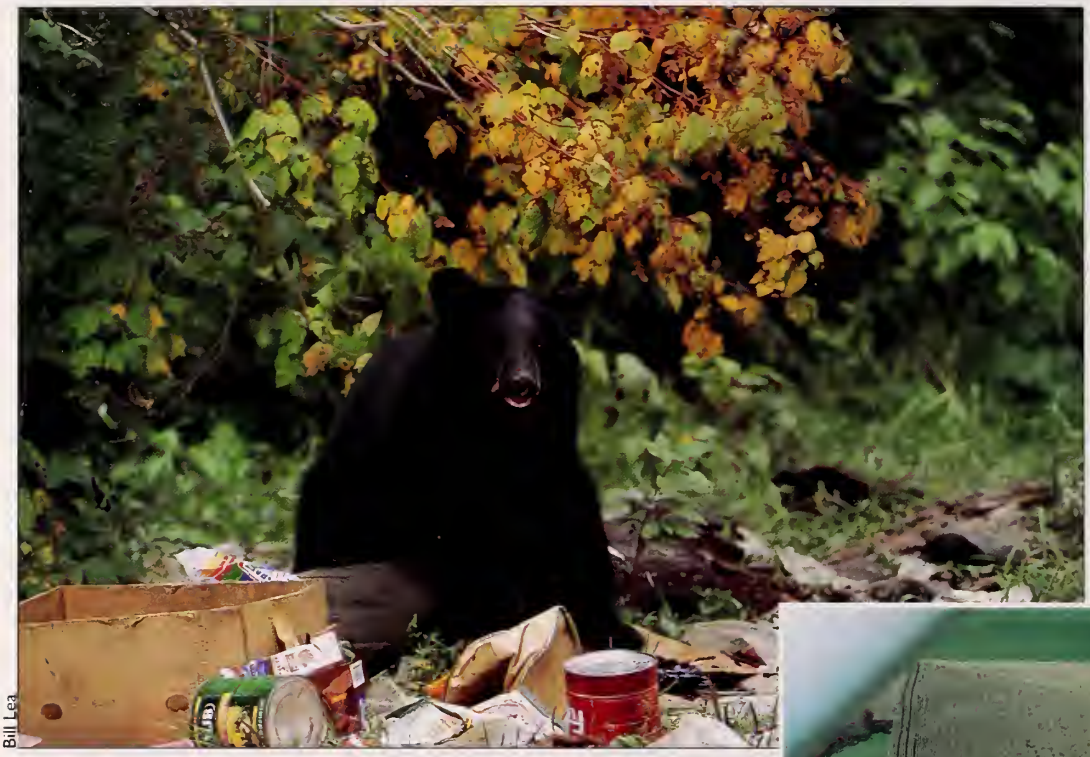
Because they are shy and solitary, black bears can live at our doorstep and walk in our footsteps, largely undetected.



Bill Lea

Black bears *(Ursus americanus)*, once considered a wilderness species, now coexist with humans over much of their range. Home and industrial developments, retirement communities, transportation corridors, plus agricultural and recreational enterprises occupy much of the previously unsettled land in many eastern and southeastern states. This arrangement of bears and humans residing close to each other has created a new challenge for wildlife managers. That challenge involves dealing with black bears posing a real or a perceived problem, in a manner that benefits both bears and people.

Damage caused by wildlife is becoming an increasingly important



Bill Lea

Left: *Bears feeding in trash, attracted by the smell of discarded food, is the second most commonly received complaint. Dumpsters and trash cans can fall victim to this opportunistic, always hungry mammal.*
Below: *Damage to corn, both field and sweet, is the most common complaint. Corn-stealing bears are often trapped and relocated to remote forests at least 50 miles away.*
Bottom: *Apiaries (groups of bee hives) attract bears most often in the spring after emerging from dens. Substantial damage can be created by a bear, (left) but electric fences are an effective deterrent (right).*

Al Bourgeois

photos by Jerry Blank

issue for many wildlife agencies. Nationwide, surveys are identifying black bears as one of several wildlife species causing agricultural damage. Although the frequency of damage activity by bears is relatively low when compared to other species such as deer, beaver, raccoon, coyote and blackbirds, the percentage of wildlife agencies reporting problems by bears increased from 13% in 1957 to 70% in 1987 according to one survey. Bear damage may only be a fraction of the economic value of the wildlife damaged resources, however, individual landowners may suffer significant losses. For instance, one bear can cause several thousand dollars damage to a large apiary (groups of bee hives), or occasionally a sheep farmer can loose several animals to a bear.

"Nuisance" situations are categorized in four ways: (1) agricultural (livestock and crops), (2) apiaries or bee hives, (3) developed areas (including property damage) such as parks, picnic areas or rural or semi-rural housing developments, and (4) urban areas. The time of year, age and sex of the bear, maturity and availability of crops or livestock, and the density of the bears all influence the type and frequency of complaints received.

Most problem bears are inadvertently enticed by a source of food even though by nature they prefer undeveloped habitats away from humans. Apiaries are often targeted by feeding bears which have emerged from their winter dens. Live trapping can be effective, however electric fences have been shown to be both inexpensive and very efficient deterrents in protecting the bee-keepers' investment.

Often simple changes by the landowner or tenant will discourage the bears' return. Removing the food source such as pet foods, barbecue grills, bird feeders, and garbage or trash offer the most successful option. Dumpsters, grease collectors behind restaurants, meat smoking facilities, freezers on an enclosed porch or in a storage building tantalize bruins with the promise of an easy, tasty meal. A black bear is a shy, powerful, usually solitary, gentle creature that will ingest anything

that remotely resembles food. Therefore, if the food is removed for up to two weeks it is highly likely that the bear will find something else to satisfy his hunger.

The number of problem bear calls received appears to be directly correlated to the amount of natural foods available, particularly soft mast (like blackberries and blueberries) in the summer and hard mast (like acorns) in the fall. Consequently, when mast productivity is high, the number of nuisance complaints decreases. High quality foods, which often provide many calories, allow the bear to store fat in preparation for denning and the birth of cubs by the sows. An adult boar (male) may gain more than 100 pounds in the fall.

Bear damage complaints are inspected by the county game warden, who either provides advice on discouraging a bear from returning, or notifies wildlife biologists that are trained and equipped to live trap and relocate nuisance animals. Although most complaints are addressed by removing or securing the food that is the attractant, trapping and transferring the bear may be necessary when the food cannot be removed (i.e. corn fields or grain storage facilities).

Trapping and relocating involves capturing the bear with culvert traps or leg snares and transporting them to less populated parts of the state. In Virginia, an average of 46 bears each year are trapped and released into new Virginia habitats, and more than 642 bears have been trapped and relocated since 1980. Release sites are usually chosen from 50 to 100 miles from the trap site.

There is evidence, particularly in other states, that bear will return by displaying a "homing" instinct. Very few Virginia bears have been observed to return when moved long distances, although it has occurred. One bear that was released in Grayson County near the town of Marion as part of a research project was killed by a hunter in Rappahannock two years later; it was one county away from the original capture site, and it had traveled about 250 miles. A research project that focused on the movements of relocated bears conducted in Virginia concluded that in Virginia short distance translocations can be effective in relocating black bears, especially when bears are moved across a physiographic barrier or an area heavily populated by humans. Bears that were moved 10.6 to 50 miles were successfully transplanted 93% of the time. Bears that were moved greater than 50 miles have never been known to return.

The traps, carrying cages and handling equipment that have been developed in Virginia have been copied by several other states (MD, MS, KY, TN, NY, LA) and a federal agency (National Park Service). Trap design plans have been sent to other

Dwight Dyke

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Above and top right: *To safely capture problem bears, culvert traps and foot snares are used. Gerald Blank, Jr., wildlife biologist assistant, handles problem bear complaints and has relocated more than 600 since 1980. Every bear is immobilized in the trap or snare to allow safe handling.*
Middle right: *Immobilizing drugs are usually administered with a dart pistol using compressed CO_2 gas.*
Bottom right: *The drug is usually effective within 8 to 12 minutes.*

states wildlife agencies. The aluminum culvert traps, manufactured from a section of corrugated aluminum pipe, can be handled by one biologist, yet it is large enough to handle a bear weighing more than 600 pounds. Carrying handles, a specially designed trigger device, dropping-type, locking aluminum door, ventilation and immobilization ports, and other design characteristics make this trap unique and very effective.

Transporting boxes or carrying cages are designed to promote and control the circulation of air, handle at least two bear at a time, provide easy installation of a drugged bear using a clamshell door, and to be handled and loaded into a truck by a single, experienced biologist. An electric winch installed on a mount that is attached to the truck's frame, combined with an adjustable boom hoist allows even the largest captured bear to be weighed or loaded onto the truck.

Handling equipment provides efficient tools for safely handling bears, while providing the opportunity to gather important data. Ear tags and tattoos are installed in each bear; any injuries arising from fights, especially found on males, or from trap abrasions, are treated with antiseptics and antibiotics. A small tooth is removed for later aging the animals.

Urban bears—those that somehow wander into populated areas, such as neighborhoods—can offer challenges to both law enforcement personnel and biologists alike. Bears are thought to travel along rivers and streams because of the available cover and food supply. These aquatic habitats often flow near or through cities. The bear that has had wrong travel decisions, or has been chased by man or his domesticated pets, is usually frightened and finds itself attracting a lot of attention. Often they retreat into a tree or heavily wooded area for safety.

Even with the cooperation of game wardens and local enforcement officers, the capture of these urban bears by biologists can require experience, patience and coor-

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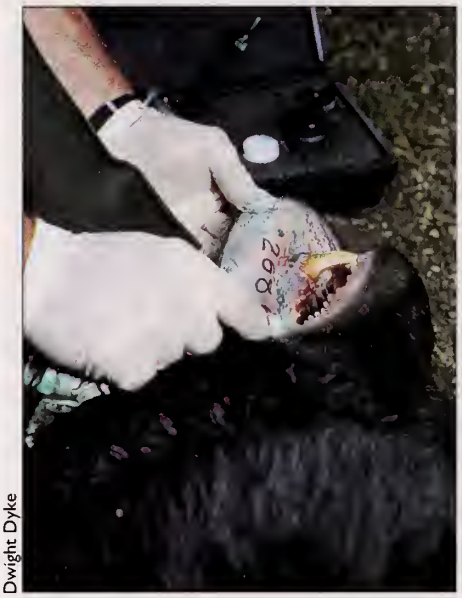
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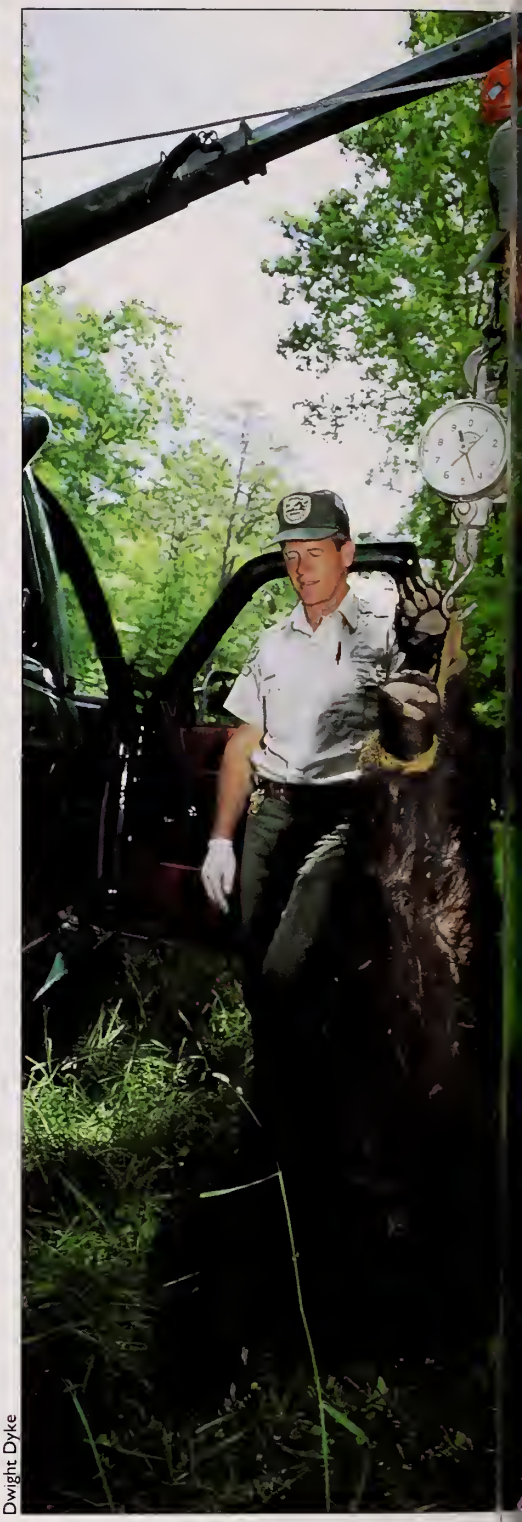
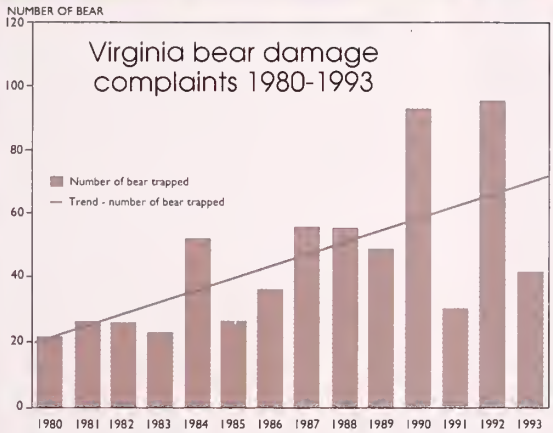

Dwight Dyke

From the top left down: *Ear tags allow biologists to identify and track individual bears.*
A small tooth is removed to determine age.
The ear tag number also is tattooed in the upper lip of each bear as a permanent marking technique.
Larry Crane (left) and Jerry Blank take additional skull measurements.
Above: *Jerry Blank and Larry Crane weigh a bear with scales attached to a boom and winch assembly.*

Dwight Dyke

Dwight Dyke

Top left: A transporting cage with a "clamshell" door to expedite loading is capable of handling two bear. This unique equipment has been designed and built by Jerry Blank and Dennis Martin.
***Middle left:** Problem bears are released in remote areas 50 to100 miles away from the capture location.*
***Bottom:** Bear complaints associated with agricultural crops, trash, apiaries, and urban areas, have increased in recent years.*



dination. Although the darting and safe handling of the bear receives the most attention, it is the management of large groups of people and difficult traffic situations that are sometimes the most demanding. The training and experience of law enforcement personnel that take the lead in managing people and the flow of vehicles has proven invaluable in successfully and safely capturing these individual bears or in allowing the bear to find its own path out of town.

City or utility company maintenance personnel have also provided invaluable services with the use of equipment such as bucket (cherry picker) trucks, nets, ropes and personnel. Fire companies have offered ladder trucks, personnel and other equipment. More than 33 urban bears have been safely removed from towns and cities by VDGIF biologists, as well as personnel from the other agencies, since 1980.

As technologies have provided more efficient tool options, biologists have used them to improve the handling of urban bears. Communications systems such as an inter-agency radio system and cellular telephones have been invaluable tools during these incidents. Laser sights on dart pistols and dart rifles have greatly improved the accurate injection of the immobilizing drugs, particularly at night. Night vision equipment has also improved darting and locating of the anesthetized bear in heavy cover.

The number of bears trapped has increased substantially in recent years, suggesting an increasing bear population in portions of the state. Additional bear handling equipment has been purchased or manufactured, and additional personnel have been trained to assist us in addressing nuisance complaints. □

Virginia's Black Bear Harvest

by Dennis Martin

Bill Lea

Dwight Dyke

Reliable indices to population trends are important in managing wildlife species such as the black bear. Providing tools for both the wildlife biologist and administrator, population trends tell whether a population is increasing, decreasing, stabilizing or shifting to new areas.

Tracking the harvest of black bears is one of the oldest and most widespread of several methods used to monitor population trends. Records of bear harvests have been kept since 1916 when the Virginia Game Commission was created and assigned the responsibility of monitoring wildlife populations. As the primary indicator of population size, the historical trend in Virginia's black bear harvest reflects relatively stable populations through about 1981 with increases since then (see Figure 1). These harvest trends, combined with other population information, have provided invaluable data for Virginia Department of Game and Inland Fisheries' (VDGIF) bear management programs. Increases in bear population growth and recreational opportunity have been the products of decisions based on this population and harvest information.

Dramatic fluctuations in the bear harvest in individual years have been a regular occurrence. Mast production, particularly acorns, has been a major influence in these harvest shifts. Research shows that food availability has considerable influence on the number of cubs produced each year. During years of high mast production the number of cubs produced increases substantially, which strongly influences the number of bears harvested in subsequent years.

These harvest data have allowed VDGIF to more finely tune bear hunting seasons. In 1974 the bear hunting season was shortened by two weeks. One week of hunting with hounds prior to the western deer season and the opportunity to harvest a bear during the first week of deer (gun) season were eliminated—this continues today. The product of shortening the season and, more importantly, delaying the bear hunting season to later in the year, shifted some of the hunting pressure to the male segment of the bear population. Research has shown that females (sows), particularly those with cubs, will den earlier than males. Delaying the hunting season protected many sows which were

already hibernating safely in their dens. The percentage of sows in the harvest decreased from 46% to 38% after the 1974 change in hunting seasons. The increases in harvest beginning in 1981 can in part be explained by the resulting increase in the number of breeding-age sows in the population (see the harvest graph). Nine of the last 13 years have shown record harvests. Increases in the number of problem bear complaints and the number of nuisance bears trapped help confirm the bear population increase suggested by hunting trends.

Improving bear populations are found throughout the eastern U. S. Similar increases in harvest and nuisance complaints have been reported in West Virginia, North Carolina, Tennessee and Georgia. Bear population increases in western Maryland have stimulated interest in their first bear hunting season. Other northern and northeastern states, including Pennsylvania, have observed increases in their bear populations and harvests during the last decade.

Along with changes in the seasons, data collected on harvested bears has changed as well. From 1928 to 1946 the numbers of bears harvested by hunters was estimated by county game wardens, who worked closely with the rural population of hunters and farmers. In 1947 the game check station system was implemented that required all harvested bears and deer to be immediately checked; turkeys were added to this list in 1951. More than 1400 check stations, usually small businesses voluntarily providing services to Virginia citizens, were established and scattered throughout the Commonwealth between 1947 and 1994.

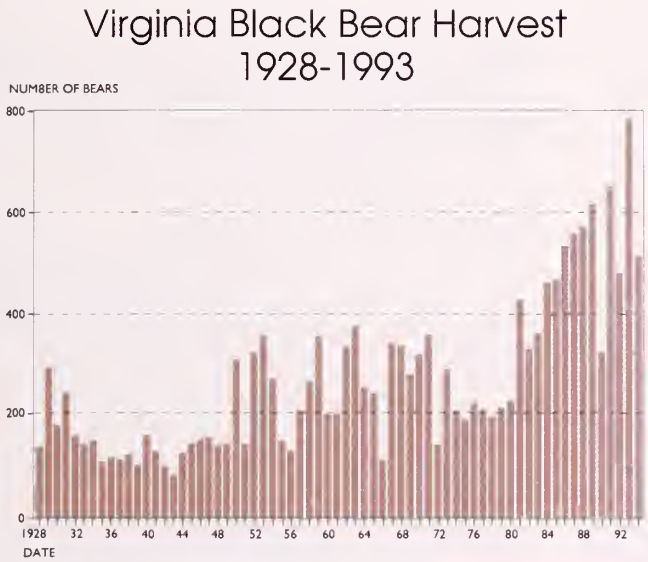


Figure 1: Black bear harvest records provide biologists with information about population trends. Data from recent years strongly suggest an increasing bear population in much of its' range.

Refinements in the check station system in 1991 established special bear check stations. Volunteers at these check stations were equipped, trained, and authorized to specifically check black bears. There are presently 62 bear check stations in 32 counties in which bear hunting is permitted.

Today, bear hunters and check station operators are expected to do several things that are important for our bear management program. Bear hunters must insure that the sex organs remain attached to the bear until checked. Check station operators are required to collect a small tooth from the bear which is later used to determine age. Check station operators also install a bear seal (tag) verifying the animal has been checked. Each check station operator also completes a check card and questions on a tooth envelope, visually checks for evidence of ear tags and lip tattoos, and confirms the sex of the bear by visual inspection.

The small tooth collected from harvested bears provides important age information about our bear population. The average age of male bears in the harvest is about three years old, with the oldest being 19 years old. Females, which may be as old as 27, average about four years old. Age information helps managers identify differences in survival between males and females and changes in survival over time.

Current harvest information indicates that Virginia's bear population is most likely increasing in numbers and range. While the total number and age of harvested bears provide an excellent base of data for Virginia's bear management programs, we continue to strive for better information. Refinements to our data collection systems will be a major benefit of the Cooperative Alleghany Bear Study (CABS). Black bear harvest not only help minimize bear problems, but the resulting check station data provide the cornerstone of management information ensuring Virginian's future opportunities to hunt, photograph, and enjoy this splendid part of our wildlife heritage. □

Dwight Dyke

Dwight Dyke

Top left and above: *Special bear check stations help biologists collect invaluable wildlife management data with the help of volunteers like Ronnie Miller (above), owner of Miller's Store in Headwaters (Highland County).* ***Above right:*** *Hunters help manage bears by reporting tagged animals.*

Black Bear Research

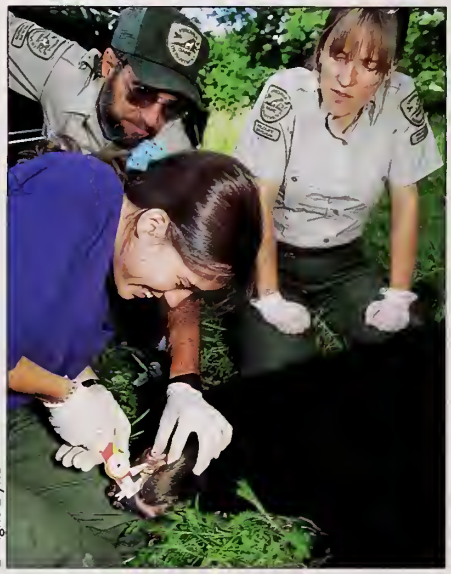
by Michael R. Vaughan

Since the early 1980's three major bear studies have been conducted in Virginia; two of these focused on bear populations in regions of Virginia where hunting is not allowed, the Shenandoah National Park and the Great Dismal Swamp National Wildlife Refuge. The third study evaluated the management strategy of translocating bears from one part of the state where bears are numerous to another part where they are scarce, for the purpose of reestablishing a viable population. In addition, we have been conducting research on reproductive physiology of captive black bears for seven years at Virginia Polytechnic Institute and State University (VPI & SU).

Shenandoah National Park:

The study in Shenandoah National Park spanned the period 1982-1992. The study was initiated to learn enough about the Park's bear population to develop a management plan that would insure the continued good health and safety of the population. The park natural resources staff wanted to know how many bears were in the park, what areas of the park were most important to bears, what foods bears depend on seasonally, and what kinds of den sites were most important to bears. They also needed to know survival rates, causes of mortality, and reproductive rates in order to calculate population growth rate.

One hundred twenty different bears were captured during this study, and more than 50 received radio collars. Signals from the collars enabled researchers to follow the bears' movements daily. At the study's completion, it was found that bear density in the park likely was in excess of 1.5 bears per square mile. The park covers 300 square miles, which meant there could be as many as 450 bears in the park. It was also found that the annual survival rate for adult female bears in the park was over 90%, but for adult males that frequently left the safety of the park, survival was about 60%. One disturbing fact which came to light was that almost 50% of the bears that died of known causes were poached on the park. As for reproduction, female bears on the park normally produced their first litter at 4 years of age and had an average litter size of two cubs, although some bears had litters of four. The growth rate of the population was stationery, neither growing nor declining.

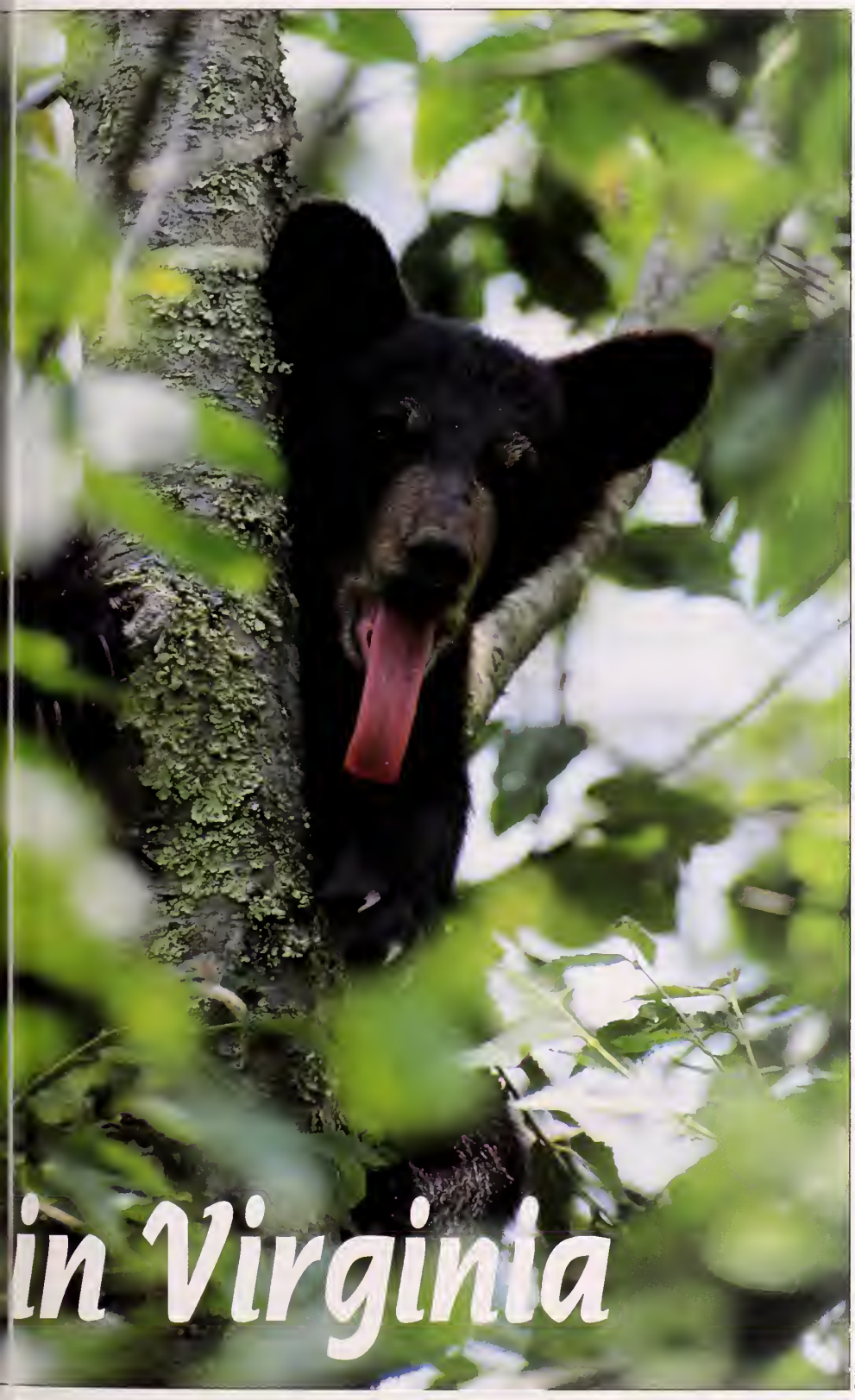


Dwight Dyke

The park's bear population was high, in part, because of the abundant food resource. Forbs (non-woody plants), berries, squaw root, which is a favorite of bears, are all found in generous quantities in late spring and early

Staff photo

Top: Chris Higgins (VPI&SU, foreground), plus Larry Crane and Betsy Stinson (VDGIF) take measurements of the large canine tooth of a bear captured as part of the Cooperative Alleghany Bear Study (CABS).
***Above:** Jack Raybourne (right) and Gerald Blank, Sr. (left) initiated research on and near the Shenandoah National Park in the early 1970's. Trapping and tagging techniques were developed and harvest data was examined.*



Bill Lea

summer. Apple and cherry trees from the days the park was homesteaded still provide fruit for bears, and the most important food resource, acorns, which make up over 50% of the annual diet, are abundant in the park. In fact, about 70% of the forests in the park are a combination of oak and hickory.

In 1985 just as the initial bear study was nearing completion, gypsy moths appeared in the park. Oak trees defoliated by gypsy moths in mid-summer put all their energy into growing new leaves and did not produce an acorn crop in the fall. Because bears and other wildlife are so dependent on acorns, we continued our study to measure the impacts of

David Liebman

Left: *Adept climbers, black bears readily climb trees to feed on fruits such as acorns and black gum or sassafras berries.*
Above: *The effects on black bears of tree defoliation by gypsy moths in the Shenandoah National Park has been studied in recent years. The moth continues to expand its range in Virginia.*

gypsy moths on the bear population. We predicted that with the loss of the acorn crop over several years, the bear population could become nutritionally stressed, resulting in decreased reproduction, survival, and population level. Bears might move off the park in search of food. Defoliation increased year after year in the park and by 1989 reached a peak with more than 44,000 acres defoliated in a single year.

Much to our surprise, data collected between 1985 and 1992 revealed that gypsy moth infestations had very little effect on the bear population in the short-term. Reproduction, survival and nutritional condition did not suffer. Why?

It may well have been because defoliation opened up the forest canopy allowing more sunlight to reach the forest floor. The increased sunlight resulted in increased production of berries and other foods, which bears take advantage of. Grapes, spicebush and pokeberry took the place of acorns in the bears' diets. We did see an increase in the movement of bears off the park during fall and an increase in the harvest of bears in the counties surrounding the park that was significantly greater than the increase in harvest in counties not affected by gypsy moths. Perhaps the most important impact we saw was the loss of den trees. About 60% of bear dens on the park are in trees. During our study, 96% of the tree dens were in live trees. We went back at the end of the study and found as many of those den trees as we could, and by that time more than 50% of the trees were dead. The big hollow trees that bears select for dens appeared highly susceptible to mortality from gypsy moth infestation. For now, our work in the park is complete, but it will be critical to monitor the long-term effects of gypsy moths on bears.

The research was conducted by graduate students at VPI & SU, and was supported by the National Park Service.

Bill Lea

Dwight Dyke

Left: *Swamps offer good habitat. More than 100 bears were captured and studied by researchers from VPI&SU in The Great Dismal Swamp National Wildlife Refuge.*
Above: *Chris Higgins (VPI&SU) removes a foot snare which are used to safely capture research bears.*

Great Dismal Swamp:

In 1984 we began a 3-year study of bears on the Great Dismal Swamp National Wildlife Refuge. The refuge staff had no information on the bear population, yet staff had the responsibility of management. We collected much the same kinds of data that we collected in Shenandoah National Park. We captured 101 bears on the refuge and put radio collars on 51. We found bear density on the refuge was high, but not as high as on the park, about one bear or less per square mile. Survival rates and reproductive rates were essentially the same as in the park, and population growth trends were again stationery. To our surprise, almost all dens were located on the ground. Bears either built nests that looked like large bird nests or they excavated dens under root systems. There were plenty of large trees available, but for some reason they were not selected as suitable den sites.

Since both the park population and the refuge population had the same reproductive and survival rates, and neither population was growing nor declining, we wondered why they had such different density levels. After studying our data carefully, we concluded that a couple of things may have been contributing to the difference. First, overlap of home range, the area the animal uses to supply its needs, was much higher on the park than in the refuge. Overlap occurs when you have more than one of the same kind of animal using the same area. In the case of Shenandoah National Park we had as many as 5 adult females using the same area. This would only be possible where there is an abundance of food. On the refuge we did not see this kind of home range overlap, indicating that the food supply on the refuge was not as abundant as on the park. Secondly,

we noted that the average age of male bears in the park was younger than the average age of males on the refuge. We believe this was because some of the older males on the park often left the park, whereas refuge bears rarely crossed outside the refuge boundary. This is significant because older male bears play an important role in regulating population level. They help hold population numbers down by killing excess cubs and chasing off young subadult males into inferior habitat where they do not breed with females or survive as well. Therefore the absence of large adult males could allow population numbers to build up to higher than normal levels. These two factors, abundant food and few large dominant males, could account for the exceptionally high number of bears in the park. However, we caution that this is speculation and may not be the case at all.

Dwight Dyke

Dwight Dyke

Bill Lea

Top: *Black bear research often involves back-breaking work.* ***Above:*** *Jerry Blank applies salve to the eyes of an immobilized bear. Drugs block the blinking response.*
Right: *Research conducted by VDGIF and VPI & SU found evidence of mating in translocated bears at Mt. Rogers during July and August.*

The study was conducted by two VPI &SU graduate students and supported by the U.S. Fish and Wildlife Service.

Translocation Study:

In 1990 we began a study to evaluate the success of moving nuisance bears captured in northern Virginia to the Mt. Rogers area in southwestern Virginia in an attempt to reestablish a viable population there. We put radio collars on 43 bears, which were moved an average distance of 185 miles to their new home. Several questions had to be answered about this management strategy: Would the bears remain at the release site? Would they try to return to their original capture site? And would they continue with their nuisance behavior, that is, were we just moving a problem from one area to another?

Bears are noted for their uncanny homing ability. Previous studies have shown that bears are much less likely to home if they are moved in excess of 50 miles. Since we had moved the bears more than three times that distance we did not expect them to return to their original home. However, only 11 of the 43 collared bears remained at the release site. The rest headed off in different directions. Some went to North Carolina, two went to Tennessee and one went to Kentucky. Some, mostly females, headed off in random directions, but several adults, mostly males, headed in a homeward direction. Although none of the bears that we were able to keep track of actually made it home, two of them were less than 20 miles from home when the study ended.

Unfortunately, survival of the translocated bears was low. Nineteen of the 43 collared bears were confirmed dead, and contact was lost with 10 bears. Vehicle collisions accounted for 10 of the 19 deaths, only three were legally harvested, two were killed illegally, and the cause of death for four bears could not be determined. Survival of translocated animals in general is usually not very high, so these results were not totally unexpected.

Despite the loss of some animals, several bears did stay in the area and started to establish a population there. We recorded no reproduction the first winter after release,

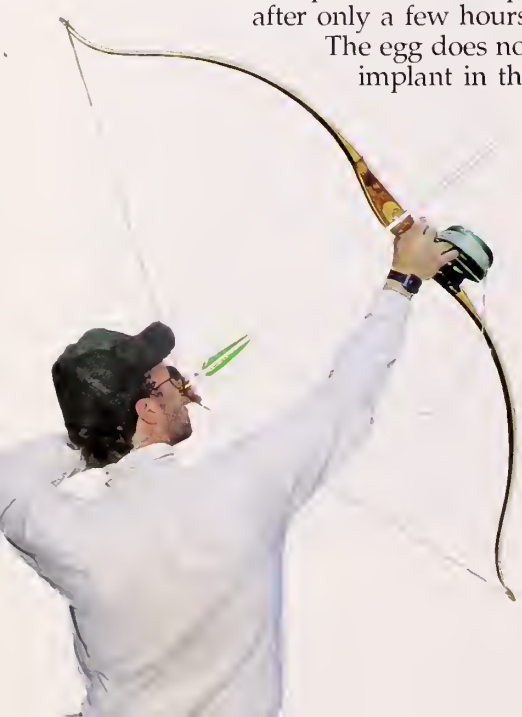
but by the second winter all adult females that remained in the area produced litters, and recent sightings would indicate that the Mt. Rogers area now has a growing bear population.

The study was supported financially by the Virginia Department of Game and Inland Fisheries, and a VPI & SU graduate student conducted the research.

Captive Bear Research:

Since 1988 we have been conducting research on reproductive physiology of captive black bears at VPI & SU. Each fall, the Virginia Department of Game and Inland Fisheries brings as many as six adult female bears to the school. These bears are captured as "nuisance" bears. They are held during the winter and studied, then released back to the wild in the spring with their newborn cubs. The ultimate goal of this research has been to develop an understanding of the role of nutrition in bear reproduction, and the role of female bears in regulating bear populations. But in order to fully understand this research a quick lesson in the unique way bears reproduce is necessary.

Bears may breed anytime from late May to early September, but the peak of the breeding season is late June through July. The fertilized egg starts to develop, but then stops after only a few hours. The egg does not implant in the uterus as it would in most animals, including humans, but floats freely for some time. This phenomenon is known as delayed implantation.



Top: Cooperative Alleghany Bear Study Researchers, Dennis Martin (VDGIF) (right), Cale Godfrey (VPI&SU), Kenny Sexton (VDGIF), and Kim Needham (VPI&SU), return from a bear den in Bath County. ***Middle:*** *VPI & SU graduate students Jennifer Higgins and Cale Godfrey prepare to climb a bear den tree as technician Kim Needham observes.* ***Above:*** *Jennifer Higgins (left) and Kim Needham prepare darting equipment.* ***Left:*** *Cale Godfrey uses archery equipment to hoist climbing ropes for den work.* ***Top right:*** *Adam Vashon (VPI&SU, right) and Dennis Martin locate a denning bear in a hollow tree in Bath County.* ***Above right:*** *A hole is sometimes cut to access the bear and any cubs. Photos by Dwight Dyke.*

Until our research, the exact timing of implantation was unknown, thus the gestation period for a bear was unknown. By drawing blood from our captive bears every 10 days and measuring pregnancy hormone levels (progesterone) we were able to determine that for bears in Virginia, implantation occurs between the last week of November and the second week of December. Since all of our bears over the seven-year period gave birth the first week of February, we determined that the gestation period for a bear was only about 60 days, the same as a dog.

In light of this valuable research information, we can ask the question, do female bears play a role in regulating black bear populations. It is critical to recognize that when wild animal populations are left alone, they will not grow unchecked. At some point they will level off; this is referred to as natural regulation. Different species have different ways of regulating their numbers. For instance, in wolf packs only the dominant male and female breed. In years of poor food supply the parents will let the pups starve. As noted earlier, in bears, adult males are believed to regulate their populations by killing excess cubs and chasing off subadult males so they will not mate with females. However, some biologists believe

that adult females may regulate bear populations by failing to reproduce in years when food supplies are low. If, for instance, an adult female with a fertile egg floating in her uterus could assess her nutritional condition and determine that she did not have enough fat stored to successfully give birth and raise a cub, she may elect not to implant the egg and wait until next year to reproduce. This is called the "blastocyst resorption hypothesis," and we are testing this in our research. We can do this by putting some bears on a high fat diet and some on a maintenance diet, measure their fat deposition, and measure their reproductive performance. We can measure fat levels and cub development using ultrasound, which allows us to look directly inside the bear. This innovative and unique use of ultrasound is new to wildlife science. VPI & SU's Animal Science department is providing the ultrasound expertise.

We have determined that bears implant fertile eggs regardless of the amount of fat they have stored, but those bears that have little or no fat stored may not be able to bring the cubs to term. If they do bring the cubs to term and give birth, they may not have enough milk to successfully raise them. This research, which has drawn national attention, is continuing as we try to learn more about levels of fat stores necessary for successful reproduction.

The Cooperative Alleghany Bear Study:

The Cooperative Alleghany Bear Study (CABS) is the Virginia Department of Game and Inland Fisheries' latest research effort for bears. The study was kicked-off in May 1994 when preparation for trapping began in Augusta and Rockingham counties, the first of two primary study areas.

The study is a large-scale, long-term study of the hunted bear population in Virginia. In fact, this study is a model of cooperation among agencies, institutions, and organizations with an interest in Virginia's bear population. Dennis Martin, a VDGIF biologist is assisting me as co-principal investigator on the study. The study is being conducted on National Forest, VDGIF and private lands and the U.S. Forest Service is a major contributor to the study. *(See the list of contributors on page 32.)*

The CABS is designed to provide critical management information for Virginia's hunted bear population. The goal is to develop an understanding of the dynamics of the bear population, which will enable wildlife managers to evaluate and predict population trends, and to effectively manage the population. The specific objectives of the study include determining birth and death rates and population density, describing distribution and habitat use patterns, developing a monitoring system that will aid in keeping

Top left: *Sow and cubs in tree den. Cubs are born during the last week in January and weigh about eight ounces at birth.*
Bottom left: *Kim Needham and Dennis Martin attach a specially designed radio collar to determine cub survival rates.*
Above: *After handling, cubs are returned to the safety of their den and mother.*
Above right: *Researchers work carefully on a sedated bear. Photos by Dwight Dyke.*

track of annual trends in bear numbers, and evaluating the influence of variables such as the annual harvest, major habitat changes, and the bear dog training season on population density.

So far the study has been highly successful. Graduate students and their assistants and VDGIF personnel banded together during the summer of 1994 to capture 111 different bears. Fifty of those bears were equipped with radio transmitters so their activities could be monitored. Thirty-eight of those receiving radio collars were females, which were followed to their winter dens. We were surprised to find that all but two of the females denned in hollow trees. Biologists occasionally work tree dens. By "working" a den we mean going to the den, tranquilizing the female, pulling the female and cubs out of the den to weigh and measure them, counting the number of cubs, checking the females' collar for fit, and returning the sow and cubs to the den. Tree dens are difficult to work because the den entrance is often 40 or 50 feet off the ground and the bear could be anywhere between the den entrance and the bottom of the tree. Because we had so many tree dens, we developed a technique to sedate bears with darts in their tree dens, measure the distance down to the bear, and cut a window in the tree that allowed us to retrieve the cubs and measure reproductive output. We then could place the cubs back in the den, replace and seal-up the window, and leave things as they were. Of course, some bears were too far down inside the tree for this procedure to work, but we did manage to work several dens. We unexpectedly found a low average litter size of 1.75 cubs per female, but we believe this was because of the high number of 3-year old bears that produced young (usually one). Normally, bears produce their first litter at 4 years of age.

One unique opportunity that came up during the fall of 1994 was for biologists to work cooperatively with houndsmen during the bear dog training season to count bears for a population estimate. Students from VPI & SU accompanied houndsmen as they treed bears, to identify whether the treed bear was a CABS bear, known by the unique blue ear tag. By using the ratio of marked bears to unmarked bears, and knowing how many bears had been marked, it theoretically was possible to calculate a population estimate for the study area. Unfortunately, the sample size of treed bears was too small to calculate a reliable estimate, but with the help of the bear hunters, we will be back this fall to try again.

During the summer of 1995 we will continue work in the northern study area and begin work in the southern study area, which will be centered in Craig and Giles counties. This study is one of the largest and most ambitious bear studies in the United States and promises to provide some of the best long-term data ever collected on a bear population.

The study is funded primarily by the Virginia Department of Game and Inland Fisheries.

Cale Godfrey and Jennifer Higgins, two of my graduate students, are responsible for data collection in this initial phase of the research. ☐

Dr. Michael R. Vaughan is a wildlife scientist for the National Biological Service, Department of the Interior and professor of wildlife at Virginia Polytechnic Institute and State University.

Dwight Dyke

Above: *The Cooperative Alleghany Bear Study involves teamwork. From left, Rachel Gray (VPI & SU), Dr. Mike Vaughan (VPI & SU), Jerry Blank (VDGIF), and Betsy Stinson (VDGIF).* ***Right:*** *Adam Vashon and Jennifer Higgins (VPI & SU) attach an expanding cub radio collar for the Cooperative Alleghany Bear Study.*

Dwight Dyke

Survival of the Harvested Bear Population

by Jennifer Higgins

One of the major goals of the Cooperative Alleghany Bear Study is to determine how stable the harvested black bear population is in Virginia. We need to know if the number of bears is increasing, decreasing, or remaining the same. So how do we accomplish this goal?

First, we need to know the survival rates for each sex and for all ages, but even more important to us are the causes of their mortality. For example, not all juvenile bears live to be adults. Since the Alleghany bear population is a hunted population, hunting would be assumed to be a major source of mortality. However, black bear cubs and yearling bears seldom are part of the harvest. So, what happens to these bears? What are the natural causes of mortality, how often do they occur, what sex and age classes are more vulnerable to these types of mortalities and why?

To answer these important questions, a radio telemetry study known as the Cooperative Alleghany Bear Study (CABS) was initiated in May, 1994. Male and female bears of all ages—cubs, yearlings, subadults, and adults—were radio collared to give us valuable information about mortality we could gain from no other source.

Initially, we live-trapped bears to identify individual bears and follow them throughout their lives. From May to September of 1994 , 111 bears (35 females, 76 males) ranging in ages from one year to 12, were captured, marked with ear tags, and released. All of the females and 11 of the male bears were fitted with radio collars, each with its own frequency and a sensor to detect movement which help us determine the timing of mortality or denning. By radio-collaring every female, we were also able to radio collar yearling bears and newborn cubs in the den.

Since cubs can grow from 5 pounds to approximately 50 pounds within their first year of life, we were faced with the problem of fitting cubs with radio collars they wouldn't outgrow. Over the past year we succeeded in developing a new radio collar design especially for cubs. We then visited the dens of 8 adult females and radio-collared 17 newborn cubs. Nine males and 8 female cubs were fitted with radio collars and all were marked with ear tags. Once cubs were fitted with radio collars, they were monitored daily to obtain survival information.

So, what have we found in the first year of this study? Thirteen adult bears were legally harvested (2 females, 11 males), one male bear was hit by a car, one adult female died of unknown causes, and two bears were killed by another bear (1 male , 1 female), presumably a larger male. Of those bears legally harvested, one female was killed in the bow season, four males and one female in the regular rifle season, and seven males were killed in the hound season. Ages of these bears ranged from 1 to 10 years and the average age was 2.5 years.

Since March, only 5 of the 17 original cubs are still radio-collared. Six cubs have died. Four of the cubs were abandoned by their mothers when they left their dens in the spring (3 separate litters), and 2 died as a result of their mother dying (she was killed by another bear soon after leaving the den). Five of the cubs lost their radio collars prematurely and one collar electronically failed. In addition, one male cub that was not radio-collared due to its small size was found dead in the den. It is suspected that this cub, which was in poor nutritional condition, starved due to the inability of its mother to produce milk. Its mother was only 3 years old.

Two of the mothers mentioned above that abandoned their cubs this spring were young, inexperienced females.

In addition, we have observed two separate instances of mortality where a young male and an adult female with cubs were killed by another bear. This may be an example of self-regulation of a population, a situation which has been observed in black bear populations existing in high densities. □

Jennifer Higgins received her B.S. in wildlife management from the University of Maine in 1993 and is currently working on her M.S. in the Department of Fisheries and Wildlife at VPI & SU where she is evaluating the survival of the hunted bear population in Virginia with emphasis on cub survival.

A Day in the Life of Radio Telemetry from the Ground

by Kim Needham

A typical day of radio-tracking using telemetry equipment (a receiver and antenna) begins by driving approximately an hour or more to locate a bear on the Cooperative Alleghany Bear Study (CABS). We generally have an idea of the area each bear has been frequenting, but a bear often moves behind ridges which may hide or distort the signal, causing the signal to bounce off of another ridge and give a false reading. Or, a bear might move up to a few miles from its last known location, making the task of locating the animal more challenging and often frustrating. There are even occasions when some of our bears move into areas inaccessible by road, which means we must try to locate them using an airplane.

The process we use to locate our study bears is known as triangulation, which involves taking bearings from three different known points and plotting them on a map to form a triangle within which you are fairly certain the bear can be found. Throughout the study area, we have established fixed locations from which these compass bearings are always taken. These permanent telemetry stations are spaced fractions of miles apart along paved and unpaved, state, forest service, and private roads. We give ourselves 30 minutes to locate a bear from our three readings, figuring that the animal won't have travelled too far within that time frame to lessen the accuracy of our final locational reading. If we go beyond our time limit, we start from scratch again. Bears are not located more than once during a given 24-hour period to provide for independent locations, locations not influenced by the previous location.

On average, we spend eight to 10 hours in the field, drive about 150 miles, and locate between three and eight bears daily, and we do this five to seven days a week. Telemetry is rather simple in theory, but on certain days and at certain times, pinpointing the actual locale of a bear does not come easily. All of the graduate students and technicians on this project have experienced the frustration of spending more than an hour trying to get a good location on a given bear. As a result, we may find ourselves visiting the same stations three, four, or five times, hopping out of a truck with a receiver, antenna, and compass to take bearings which may only change by a few degrees each time.

Eventually, all of us leave each site with one of three outcomes: an acceptable location for the day; a general idea of where the bear is without an acceptable location; or little confidence that you have any idea of the bear's whereabouts.

Any way you look at it, it's all part of the routine of black bear research. □

Above: *Research personnel spend countless hours tracking bears for the Cooperative Alleghany Bear Study. VPI & SU research technician, Kim Needham (left), and VDGIF biologist assistant, Jerry Blank, pinpoint a bear's location. Photo by Dwight Dyke.*

Kim Needham is a graduate of VPI & SU with a B.S. in Wildlife Science. She joined the Cooperative Alleghany Bear Study in January 1995 as a technician.

Black Bears: My first choice in research

by Cale Godfrey

I can still remember the first time I saw a black bear. My family had gone to our cabin in northcentral Pennsylvania for the weekend. While driving around one afternoon we happened to see a black bear walking through the woods. I immediately hid on the floor in the back of our pickup truck.

I was certain that the bear was going to attack me if he saw me. Twenty years has not been able to erase the sight of that bear from my mind.

Ever since that day, bears have been a part of my life. I spent many more weekends at our cabin, and I have lost count of the number of bears I have seen, but I always knew what direction I wanted my life to go in. I was not certain that dream would ever become reality until Dr. Mike Vaughan from VPI & SU called and offered me a graduate student position on the Cooperative Alleghany Bear Study (CABS). There was no hesitation in my acceptance of the offer. My dream was coming true.

The CABS is an enormous undertaking. It aims to investigate almost all facets of black bear ecology in Virginia. The result of all this research will be the best possible management of black bears for Virginia.

Black bear research is filled with special challenges ranging from monitoring bears by aircraft ***(top left)*** *to attaching radio collars on the ground* ***(left)****.* ***Above:*** *from left: Betsy Stinson, Larry Crane, and Rachel Gray (VPI & SU) attach a radio collar. Photos by Dwight Dyke*

Although I participate in all research activities, my role is but a small part of the whole equation. The objectives of my research are to develop a better understanding of black bear reproductive biology and denning ecology.

Reproductive biology is concerned with the age at which female bears or sows produce their first litter of cubs, how many cubs are born in each litter, how often sows produce a litter, and what factors influence these variables. These variables are an important starting point for the CABS. Black bears have among the lowest reproductive rates of all terrestrial animals, meaning they have only a few young over a long period of time. Reproductive variables differ among black bear populations, and small differences in these variables can greatly influence the rate at which the black bear population grows. Understanding the black bear's reproductive biology enables wildlife biologists to determine the potential for growth in a black bear population. Realizing the potential growth in the black bear population, wildlife biologists are able to gauge what effect hunting and environmental factors have on the black bear population size.

The denning behavior of the black bear has fascinated wildlife biologists for many years. Black bears den in brushpiles, tree cavities, rock cavities, hollow logs, and excavations under logs and tree roots. An adequate amount of suitable den sites is important to a black bear population. Suitable dens provide a place for all bears to avoid severe winter weather, particularly for female bears giving birth to cubs.

Little is known about black bear den sites in the George Washington or Jefferson National Forests. A few interesting trends were noted this past winter while locating bear dens. Of the 27 dens we located this winter, 25 of the bears had selected hollow tree cavities as den sites. These trees averaged about 3 feet in diameter, and most tree dens were located in large drainages with older age timber stands. Understanding that bears may relate to the habitat in this way will enable biologists to provide for the denning needs of Virginia's black bear. ☐

Cale Godfrey received a B.S. degree from Penn State University and is currently working on his M.S. degree at VPI & SU. His research involves the breeding biology and denning ecology of Virginia's black bear.

CABS: A Truly Cooperative Management Study

by David E. Steffen

How can we be sure about the future of black bears? Who is responsible for the management of black bear populations in Virginia? The Virginia Department of Game and Inland Fisheries (VDGIF) is the principal agency responsible for managing our wildlife resources.

Hunters, through license fees and extra taxes on hunting equipment, have provided the backbone for our wildlife programs. Now, the job of managing black bears requires the kind of partnerships, joint ventures, and cooperatives that are becoming the tools of choice for the private sector. Combining forces, partners become more effective by focusing on mutual interests. Additional expertise, time, equipment, funding, information, and technology are the strengths that partners bring to wildlife management issues.

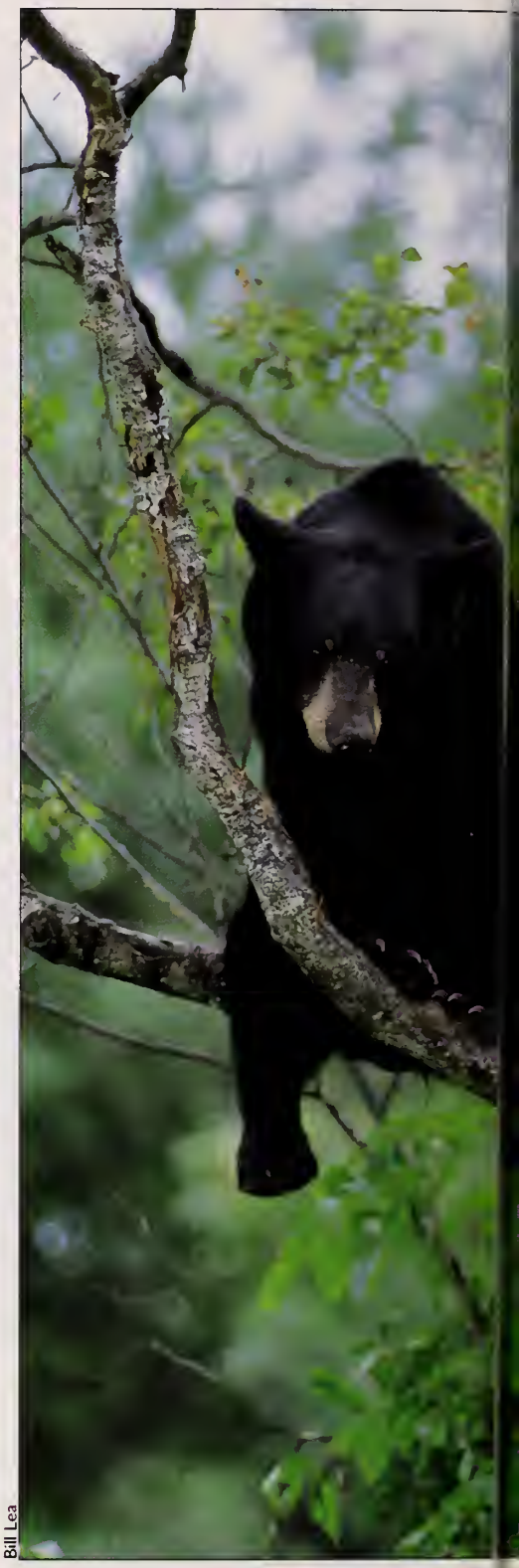
The Cooperative Alleghany Bear Study (CABS), even in its beginning stages, has brought together many partners with a shared interest for wise black bear management in Virginia. Through significant donations of time, talent, and money, the following partners already have contributed to the current research effort:

- Virginia Department of Game & Inland Fisheries
- Pittman-Robertson Federal Aid to Wildlife Restoration
- Virginia Polytechnic Institute and State University
- U. S. Forest Service (U. S. Department of Agriculture)
- National Biological Service (U. S. Department of the Interior)
- Georgia Pacific Corporation
- Union Camp Corporation
- Virginia Bear Hunter's Association
- Virginia Houndsmen and Sporting Dog Association
- Virginia Wilderness Committee
- Westvaco
- Wildlife Forever Foundation
- Virginia Chapter of the Sierra Club
- Northern Shenandoah Valley Audubon Society

These supporters of the study, all agree that the responsible course of action is to gain more reliable knowledge about the population dynamics and habitats of bears. □

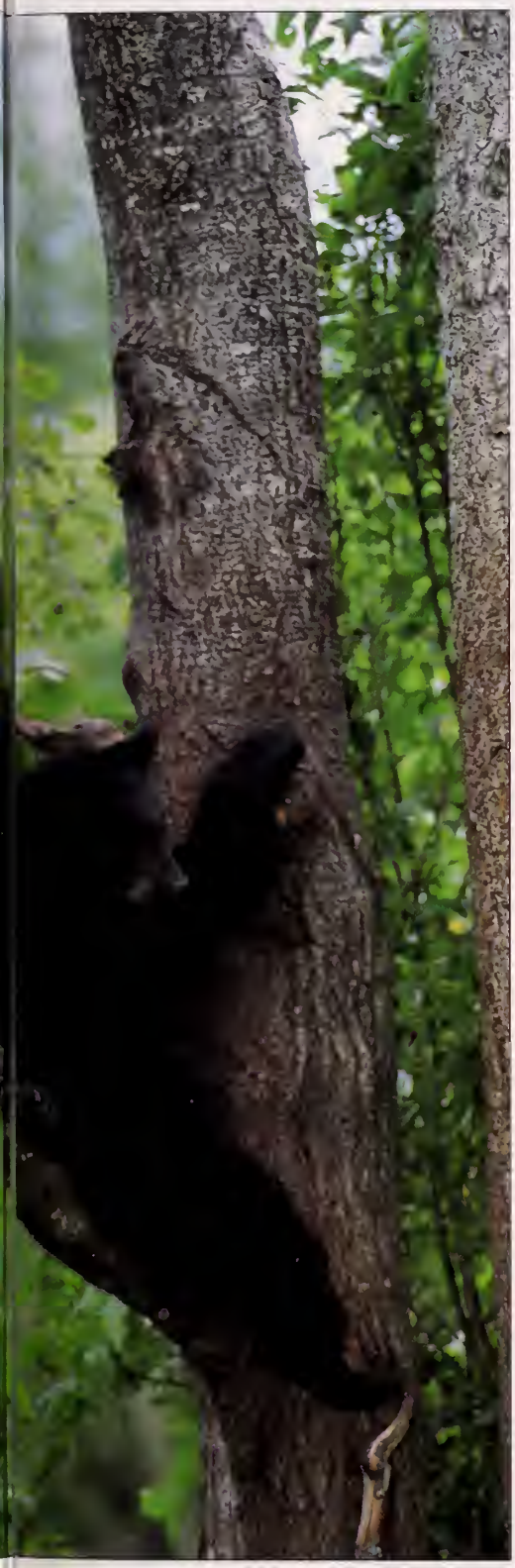
Dennis Martin

David E. Steffen is a forest wildlife program manager in charge of research survey and inventory for bear, deer, and turkey projects. He works out of the Vinton office.

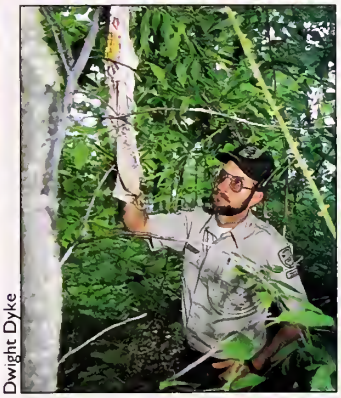


Bill Lea

Above: *The future for this sow and her yearling cub depends on partnerships among many cooperating agencies, organizations, businesses, and individuals. Management lessons learned through research would b impossible without the dedicated work of many individuals.* ***Left:*** *VPI & SU research technician*



Dwight Dyke



Dwight Dyke

Rachel Gray (right) weighs a recently born cub, while graduate student Jennifer Higgins (left) looks on. ***Above left:*** *Critical field support is provided by VDGIF employees like biologists Al Bourgeois (preparing a tranquilizer dart) and (above right) Larry Crane (checking bait donated by a private business).*

Contributors

As with most wildlife research projects, considerable effort was expended during the first trapping season of the Cooperative Alleghany Bear Study. Only with such an effort by so many people could the capture of 111 individual bears have been a reality. The following is a partial list of those persons who have participated in the CABS.

VDGIF
Jerry Blank
Oliver Burkholder
Fred Frenzel
Joe Huffer
Roy Swartz
Waynlee Zollman
Eric Sheets
Gene Sours
John Pound
Kenny Sexton
David Colaw
Roger Propst
Ben Powell
Tom Cramer
Jay Jeffreys
Bob Turney
Al Bourgeois
David Kocka
Larry Crane
Roger Houck
Betsy Stinson
David Steffen
Mike Humphreys
Rita Crane
Dennis Martin

VPI & SU
Cale Godfrey
Tracy Webster
Christine Long
Jennifer Higgins
Adam Vashon
Rachel Gray
Kim Needham
Chris Higgins
Christie Gunnels
Chris Ryan
Kevin Drury
Michael Vaughan

USFS
Scott Klinger
John Bellemore
Jesse Overcash
George Annis
Nadine Pollock
Skip Griep

The following is a partial list of the individuals and companies who have contributed bait and other items to the Cooperative Alleghany Bear Study.

Augusta Frozen Food Coop.
Linda Cox
Edwards Furniture
Flowers Baking Company
Graves Mountain Lodge
The Homestead
Buena Vista IGA
Staunton Krispy Kreme
Covington Krogers
Shenandoah's Pride Dairy
David Stinnett
T & W Meat Market
Todd's Barbecue
Valley Market
Verona Food Discounters
Weyers Cave Fire Dept.
Bear's Bakery
Luther & Burlon Crider
Farmstead Family Restaurant
Gayle's Market & Country Ham
Grottoes Volunteer Fire Dept.
Bridgewater IGA
Mt. Jackson IGA
Clifton Forge Krogers
Mullins Slaughter House
Skyland Restaurant
South Harrisonburg Super Fresh
Staunton Krogers
The Meating Place
Bobby Turner
Valley Supermarket
Webb's Store
Wholesome Foods Country Store
Blacksburg Kroger
Ryans Steakhouse, Christiansburg
Texas Steak, Christiansburg
Farmhouse Restaurant

Deputy Secretary Speaks At Field Trial Event

As in previous years, a number of field dog trials are scheduled to be held on Wildlife Management Areas in October. For the first time, however, enthusiasts are also using the resources offered by Virginia state parks. This month, Twin Lakes State Park in Prince Edward County will host its second field trial, September 22-24.

The popularity of field trials continues on the upswing, noted Tom Hopkins, Virginia's Deputy Secretary of Natural Resources, who attended an April field trial at Twin Lakes on behalf of Becky Norton Dunlop, Secretary of Natural Resources. "A field trial is a great opportunity to enjoy some of life's great pleasures: the unsurpassed beauty with which we in Virginia have been blessed; the company of good people and fine animals, the chance to witness all the training, care and love come together in partnership and performance," he said.

The event, the first one held at a state park, was sponsored at Twin Lakes by the Tidewater Retriever Club, a club founded by hunters in Gloucester County but now with members primarily in the Richmond area. The group hosts two field trials annually that are sanctioned as licensed hunt tests of the North American Hunting Retriever Association. With about 200 participants and spectators, the field trial at Twin Lakes was the largest ever in the U.S., according to park officials.

It was a significant event, explained Hopkins. "Hosting a sporting event and a sportsmen's group at a state park demonstrates the commitment of Governor Allen and the Secretariat of Natural Resources to strengthening the partnerships between our sportsmen and those charged with the public stewardship of our natural resources."

Dwight Dyke

Using state parks for such events broadens the array of resources that hunters, sportsmen and hunting dog enthusiasts can tap for these activities, Hopkins noted. At the same time, it helps to expose more Virginians to these forms of outdoor recreation, and the time-honored traditions and values they represent. □

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